# Extrusion-cooking of maize and relationship between amylose:amylopectin ratio and snack features

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- Effects of extrusion-cooking on starch properties
- Role of amylose:amylopectin ratio in defining snack characteristics
- High amylose maize is the most suitable raw material for filled snacks

Nowadays, the growing demand for ready- to-eat foods makes snacks an ideal product for the consumer due to their ease of use. In this frame, maize is a suitable ingredient in gluten-free formulations and thanks to its high starch content is widely used in snack production. However, the role of amylose:amylopectin ratio in defining the characteristics of these products has not been fully understood. The aim of this work was to study the effects of different amylose:amylopectin ratios in the production of filled snacks. Maize flours (particle size <250 µm) differing in amylose content were considered: i) a conventional hybrid (P1547, amylose = 18%), ii) a high-amylose hybrid (Amylor, amylose = 42%) and iii) a waxy hybrid (Pioneer 1547E, amylose = 2%). Snacks were obtained by extrusion -cooking performed using a co-rotating twin- screw extruder (screw speed: 100 rpm; temperature: 117 °C; pressure: 70 bar). This work focused first on the study of the raw material and how extrusion -cooking affected its properties. In particular, the following features were assessed: starch susceptibility to enzymatic hydrolysis (AACC no. 76-31.01), pasting (Micro- Visco-Amilograph®, Brabender, Germany) and hydration (Water Absorption Index and Water Holding Capacity) properties. Snacks were also characterized in terms of: shape (by image analysis), volume, density, porosimetric distribution (by mercury porosimeter P240) and texture (by TA.XT, USA). Regardless of the maize flours used, extrusion-cooking promoted significant changes in starch properties. Starch susceptibility to enzymatic hydrolysis significantly increased (up to 12 times) after extrusion-cooking suggesting starch gelatinization, as well as the absence of the typical gelatinization peak in the MVAG test. After treatment, WHC significantly increased (up to 4 times) due to the capacity of gelatinized starch to absorb and hold water at room temperature. The characterization of the snacks highlighted the relation between raw material and snack attributes. The best technological performances were found in snacks



formulated using high amylose, probably due to its compact starch structure. Snacks formulated using high amylose showed the highest density (1.38 g/cm3), the lowest section area (233 mm2), the highest porosity rate (67%) resulting in a high number of small pores per mm2 and the highest breaking force (31 N). In conclusion, high amylose rate significantly affected flour behavior during extrusion-cooking and led to the best technological performance, suggesting it could be used as an innovative ingredient in filled snack production.

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